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backward into the œsophagus. The mouth cavity is then again opened and the same process repeated. To prevent the food being sucked back from the œsophagus, it is probable that some of the numerous fibres in the muscular sack near the origin of the former can, by contraction, close its opening, but in any case as the trunk presents a free tube, and the œsophagus leads into the closed alimentary canal, it is evident that the former offers the easiest route for a supply to fill the mouth vacuum.

In the muscular mouth sack, we have thus a pumping organ, of action too simple to be misunderstood. As for the so-called "sucking stomach," its delicate membranous structure is certainly not adapted for sucking functions, and it probably serves only as a reservoir. It is usually found to contain nothing else than air, but Newport asserts that immediately after feeding food is also found in it.

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THE CRITICS OF EVOLUTION.

BY J. S. LIPPINCOTT.

THERE is a large class of minds even among those who esteem themselves educated, who have no acquaintance with science and another, perhaps equally large, who have no idea of what is meant by the scientific spirit. These all imagine, perhaps, that the world of things or phenomena around them, has ever been pretty much as it now appears to the superficial gaze, and that men have always known about as much about the earth, its origin, development and productions, as they now know. They appear to be unconscious of the fact that a century ago we knew almost nothing of the constitution of matter, and were holding the same crude and puerile ideas about nature that were held by the ancients 3000 years ago. They do not seem to be aware that but few conquests, from the domain of the unknown had been made in physical astronomy, and that almost all our knowledge of the composition of the earth and its myriads products, animal, vegetable and mineral, have not yet been reached.

A century ago the simplest phenomena were inexplicable; no man knew why he breathed, or why a candle burned; why a plant grew; what use a leaf served; what the air is composed of; or that water is a compound fluid. A century ago, many more than even now-a-days, were perfectly indifferent as to the nature of things around them, regarding them, shall we say, with brute "unconscious gaze."

Why this ignorance of nature? The science of chemistry, a new revelation of the wisdom of the Creator, had not yet dawned upon the childhood of ignorance. When men began to question nature in the scientific spirit, began to weigh and measure and to question again and again while doubt rested upon her replies, they entered upon the path of discovery. This path has since been ardently pursued by hundreds of minds, qualified for the noble task of explaining His ways in the earth, by elucidating the method He is employing daily around us and within us, and by which He has ever been laboring for the good of His creatures. By following the path of research, accumulating facts, collating them, and constructing theories that would most fully account for the interdependence of the phenomena observed, man has penetrated into the mysteries of creation and in some directions already stands almost upon the brink of "the unknowable," beyond which it is impossible for finite minds to go. As each grand generalization has prepared him to take a new stand-point, and from thence to obtain a wider view of natural phenomena, his conceptions have become more comprehensive, until he may yet grasp the origin of the universe and been enabled to understand the laws by which it was condensed from the all pervading nebulous condition which has been termed chaos.

Many we are aware denounce theories as vain imaginings; but such should learn that a theory is but an expression of the relations of phenomena, a condensed presentation of all the facts in their natural order, and that it is by this artificial memory the enquirer is enabled to grasp his attainments, and to be lifted up as by a scaffolding for the more thorough study of new phenomena, otherwise incomprehensible, and for the construction of a building which shall embody all the truth. Theories, let it be understood, are always tentative, always a working apparatus, to be remodeled as knowledge advances, and indispensible to its progress. Theories are not, as many suppose, the offspring of imagination purely, but are like a figure cast within a mold, or like a casting perfectly shaped thereon. The mold upon which theories are formed is the mass of facts observed in their just relations, as far as man has yet discovered and determined.

Emboldened by his success, the man of science is pursuing the path of discovery, convinced that though there may be many things beyond his comprehension, there is nothing that he should consider beyond his enquiries. Bacon in his "Advancement of Learning," sagely advises, "Let no man out of a weak conceit of sobriety, and an ill-applied moderation, think or maintain, that a man can search too far, or be too well studied in the book of God's word or in the book of God's works; divinity or philosophy; but rather let men endeavor an *endless* progress or proficience in both." It is in the highest degree probable that the Creator designed he should follow this path, both for the further development of his intellectual powers and for the promotion of the cause of truth and righteousness in the earth. It is evident that our enlarging conceptions of creative power, widen the avenue through which we receive impressions of the Divine glory, and that the views of the educated modern scientist are infinitely expanded beyond the narrow confined range of the ancients. His new and grander generalizations of knowledge are indeed so many wonderful revelations of the Creator, who, as it were, thus speaks almost face to face with man.

Unfortunately many minds, especially those of purely theological bias, appear to be incapable of comprehending the value of the grand results that have followed scientific research. They hastily dismiss them, with the remark—all these researches are merely material—"of the earth, earthy," and beneath the consideration of beings living in a spiritual world and destined to an eternity of spiritual existence. This estimate of the importance of the labors of men of science, whose studies have given us almost all the comforts and invaluable appliances that have lifted us above our semi-civilized ancestors, appear to us, to be a very unworthy and very superficial view. The progress of civilization is intimately connected with, is indeed dependent upon, advance in the useful arts, which are founded directly upon science, and to reject science and contemn its advocates, is to spurn one of the chief factors in the work of human elevation.

Among the grand generalizations or results of the labors of naturalists of recent date, is that entitled Evolution, which is indeed the noblest product of a century of scientific thought; the top-stone of the intellectual building that man has been erecting.

Scientists falsely assumed to be Atheists.—Though it is not a part of the mission of science to explain or even to discuss the supernatural, philosophers readily admit, that all *real origination* is supernatural. The question is whether they have yet gone back to the origin, and can assert indubitably, that the present forms of plants and animals are those originally created by miraculous exercise of power. Studying facts and phenomena in reference to proximate causes, or endeavoring to trace back the series of causes and effects as far as possible, is a process strictly scientific and perfectly legitimate. It is the process of all science. Did not Newton, by this method, rise from the observation on the fall of an apple, to the far-reaching discovery of the laws of gravitation? Let it be observed also as in the highest degree instructive in this connection, that Newton, the pious Sir Isaac, the demonstrator of the truth of prophecy, a sincere and humble believer in the leading doctrines of our religion,—was because of his demonstration of the laws by which the universe is sustained, pronounced by the ignorant and unwise ultra-pious of his day, *an atheist.*[1] They hastily assumed that, because the philosopher had traced the working of the Divine hand, had demonstrated the method by which He labors, that God had been shut out of the creation. Here is something more foolish than any philosophy, and paralleled only by the reasoning of our champion Anti-Evolutionists.

The path pursued by Newton is that followed by Darwin, who has adhered to the scientific spirit, deeming the task of science to be, as expressed by Agassiz, "to investigate what has been done, to inquire if possible *how it has been done*, rather than to ask what is possible for the Deity, since we can know that only by what actually exists." Though Darwin has not deemed it his duty to become an exponent of natural theology, *he has emphat-*

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[1] The list of those who have been denounced as infidels and atheists, include almost all great men of science—generals, scholars, inventors, philanthropists. The deepest Christian life, the holiest Christian character, have not availed to shield the combatants. Christians like Sir Isaac Newton and Pascal, and John Locke and John Milton, and even Howard and Fenelon, have had these weapons hurled at them. "*The Warfare of Science*," by Andrew D. White, LL.D., President of Cornell University. See also lists of persons charged with infidelity and atheism in "Le Dictionnaire des Athées." Paris, An. VIII. (1799).

ically contradicted the base charge brought against him that "he does not recognize and does not admit either Divine agency or Divine supervision in furnishing, or in peopling the world." This view is nowhere expressed in his books. I believe he nowhere uses the phrase "fortuitous conjunction of circumstances," which some of his critics "roll as a sweet morsel under their tongues," nor can his language "natural selection" be rightly construed to mean any such fortuitous conjunction;" nor does he "sneer at the idea of any manifestation of design in the material universe." Darwin maintains that the origination of a *species,* no less than that of an *individual* is *natural.* He has also defined his meaning of the word *natural,* and asserts, choosing the language of the distinguished Bishop Butler, whom none will deny was thoroughly orthodox,[1] "The only distinct meaning of the word '*Natural,*' is, stated, fixed, or settled, *since what is natural as much requires and presupposes an intelligent agent to render it so—that is—to effect it continually or at stated times*—as what is supernatural or miraculous does to effect it for once."

This passage from Butler Darwin has placed at the very portal of his work "The origin of species by means of natural selection or the preservation of favored races in the struggle for life,"—upon the reverse of the title page, where it should be the first to meet the eye of the reader.

Here is an emphatic acknowledgment of belief in Divine agency, a recognition of intelligent supervision throughout the "processes of evolution." It is no part of our mission to account for the vagaries of the critics friendly to Darwin, who have misconstrued his principles. He must speak for himself, and he has here spoken in unmistakable language.

Evolution Generally Accepted.— Few of the objections that sprang into life the moment the doctrine of development was proposed for our acceptance, now give evidence of persistent vitality. Time has consigned, or is consigning, them to oblivion, and "evolution is taking its place as part of the furniture of the human mind."

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[1] "Analogy of Religion natural and revealed to the constitution and course of nature," by Joseph Butler, Lord Bishop of Durham. This passage appears in chap. I of Part I. on Natural Religion, on p. 105 of Harper's edition of Bishop Butler's Analogy of Religion, &c. The following succeeds it in order and is quite pertinent to the present discussion. "And from hence it must follow, that persons' notions of what is natural will be enlarged, in proportion to their greater knowledge of the works of God and the dispensations of His Providence."

Like other accepted theories, evolution is the natural growth of closer and deeper observation, and therefore of more accurate knowledge of the relations of facts. The doctrines of evolution have been reached in the perfectly legitimate manner by which all the other great truths of science have been discovered. It has been a natural outgrowth from facts, and is not, as some suppose, an invention sprung from the imagination of a dreamer. It is one department of "that science which is but common sense methodized and extended," and "is indeed the highest stage of human knowledge."

It has appeared to us to be a reasonable opinion that any one endowed with the scientific spirit would not go to a theologian to obtain a just estimate of the value of a scientific theory, but would visit an enlightened expert for an opinion. "The former class continually labor to make tradition confront discovery and feel constrained to view with jealous distrust the rapid advancement of practical knowledge." Their inquiries are not whether any new fact is absolutely true, but whether it is in accordance with conceptions they consider established. Those who really desire to learn what evolution is, and its profound significance, and are possessed of the proper faith in nature as a revealer of intellectual truth, will not consult Joseph Cook's "Biology," the scientific charlatanry of which has been thoroughly exposed in the *New Englander* for January, 1879, where its taste and rhetoric have been pronounced "execrable," and which in the *Saturday Review* is the subject of an article entitled "*Spread Eagle Philosophy.*" With his religious sentiments properly, we have no controversy. Nor would they look with any confidence upon the objections of writers whom they should no more regard as authority on scientific questions than they incline to accept their views on theology. Dr. Hodge, of Princeton, has been well answered by Dr. Gray in his "Darwiniana,"[1] to which I would refer the reader. One of his remarks may as well here be reproduced; "It may be well to remember that of the two great minds of the 17th century, Newton and Leibnitz, both profoundly religious as well as philosophical, one produced the theory of gravitation, the other objected to that theory, that it was subversive of natural religion; also that the nebular hypothesis, a natural consequence of the theory of gravitation and of the subsequent progress of physical and astronomical discovery, has been denounced as atheistical even down to our day. It has now outlived anathema," and is no longer rejected even by theologians.

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[1] What is Darwinism? by Charles Hodge, Princeton N. J. By Asa Gray in his Darwiniana, pp. 266–282, and pp. 137–258.

Dr. Asa Gray acknowledges that Darwin in his style is loose, and that he might have been more guarded had he chosen to be so. Dr. Gray, however, acquits him of all atheistic intent, and remarks that his view may be made clear to the theological mind by likening it to that of the "believer in the general but not in particular Providence," a view which prevails among mankind.[1] There is no need, says Gray, "to cull passages from his works to support this interpretation, while the author—the most candid of men—retains throughout all the editions of the "Origin of Species," the two mottoes from Dr. Whewell and Bishop Butler, which, by implication, entirely acquit him of atheism.

It may be well to quote the passage from Dr. Whewell, the able author of "A History of the Inductive Sciences;" that from Butler has already been adduced: "But with regard to the material world, we can at least go so far as this—we can perceive that events are brought about not by insulated interpositions of Divine power exerted in each particular case, but by the establishment of general laws." (Whewell's Bridgewater Treatise.)

Another extract from Dr. Gray we will present the reader. In physical and physiological treatises, the most religious men do not think it necessary to postulate the First Cause, nor are they misjudged by the omission. But surely Darwin does acknowledge a Creator, not only by implication but most explicitly where one would most naturally look for it, namely—at the close of the volume in question. "Authors of the highest eminence seem to be fully satisfied with the view that each species has been independently created. To my mind it accords better with what we know of the *laws impressed on matter by the Creator*, that the production and extinction of the past and present inhabitants of the world, should have been due to secondary causes, like those determining the birth and death of the individual" * * * "there is grandeur in the view of life, with its several powers, having been *originally breathed by the Creator* into a few forms, or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been and are being evolved."[1] "If these expressions," says Dr. Asa Gray, "do not refer the efficiency of physical causes to the First Cause, what form of words could he use."[2]

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[1] Darwiniana, p. 258.

The Teleology of Evolution.—One of our objecting critics forgets that he is quoting from an old work of Huxley's, where he says "that which struck me most forcibly was the conviction that teleology (the science of Final Causes) had received its death blow at Darwin's hands."

To the above I may reply, following Dr. Gray and other able defenders of Darwinism, that as regards the old teleology, the less said in its defense the better for the cause of religion. The difficulties which its principles will not explain are many and serious.[3] Darwinian teleology has the special advantage of accounting for the imperfections and failures which have loaded the doctrine of teleology with far more than it could bear. The Darwinian teleology not only accounts for the failures and the successes, but it turns them to practical account. In Darwinism we have a teleology that accords with, where it does not explain, the principal facts, and is free from the common objections. The Darwinian system, as we understand it, coincides with the theistic view of nature; it not only acknowledges purpose, but builds upon it. It understands all nature to be of a piece, and it is clear, therefore, that design is in some way mixed up with it. If adaptation and utility are the marks of design, what then, we would ask, are the organs not adapted to use the marks of?—and there are numerous functionless organs in almost every species of animal. Man has sundry perfectly useless parts which the old teleology cannot account for, and which are great stumbling blocks in the way of the olden style natural theologians. But evolution shows their true place and *demonstrates that these structures are relics of a former state of being.* "It is," says Haeckel,[4] precisely this widespread and mysterious phenomenon of rudimentary organs, in regard to which all other attempts at explanation fail, which is perfectly explained, and indeed in the simplest and clearest way, by Darwin's 'Theory of Inheritance and Adaptation.'"

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[1] "On the Origin of Species by means of Natural Selection," &c. By Charles Darwin. New York, 1873. New edition from the sixth English edition, &c., pp. 428, 429.

[2] Darwiniana. By Dr. Asa Gray. Pages 370, 378, 379.

[3] Darwiniana. By Dr. Asa Gray. Pages 268, 269.

[4] "The *History of Creation;* or the Development of the Earth and its Inhabitants by the action of Natural Causes," by Ernst Haeckel. 1876. Vol. 1, p. 16.

These remarks could be greatly extended, with vivid demonstration, but I must content myself with referring to an admirable popular work by William D. Gunning, entitled "*Life History of our Planet*," where one may learn that the human body is a "library of anatomical history." Finally, I adduce the testimony of Dr. McCosh, an unimpeachable witness, who asserts that, "the doctrine of development does not undermine nor in any way interfere with the argument from design."[1]

Dissent of Agassiz.—Much stress has been placed upon the dissent of Agassiz and Dawson from the views of the evolutionists, and they are quoted as veterans who of course we are bound to regard as speaking *ex cathedra,* and therefore not to be gainsayed. "Have any of the rulers or of the Pharisees believed on him? was asked of old," and some critics ask the same question and forget that it is recorded of Christ, "For neither did his brethren believe in him." What to the seeker for truth does it matter now or did it matter then, who believed or now believes? The votaries of science are not swayed by authorities but by truth. Their motto should ever be, "Nullius addictus jurare in verba magistri." The opinions of aged men, unless they have kept themselves abreast of the thought of the day, are frequently unwise, and are seldom regarded by those who prefer to seek truth for its own sake regardless of the reflections of Mrs. Grundy. "By the time," I have heard a most eminent man of science observe, "by the time a man of science attains eminence on any subject he becomes a nuisance upon it, because," if advanced in age, "he is sure to retain errors which were in vogue in his youth, but which the new race has refuted. These are the sort of ideas that find their home in *Academies*, and out of their dignified windows pooh-pooh new things." (Bagehot's Physics and Politics, p. 60.)

Science enjoys perpetual youth. Her votaries grow old and pass away, and their opinions with them, unless founded on eternal principles. "Her goal to-day is her starting point to-morrow." It is an historical fact that no physician over forty years of age at the time of the discovery of the circulation of the blood by Harvey, ever believed in that discovery. Why did they not believe in it? Because it was not in accord with their inherited prejudices, with the experience of their lives, and their personal pride scouted at the discovery, by a young man, of valuable facts that they ought themselves to have seen long ago, were they true. Thus it was with Agassiz, who ought to have seen the truth of evolution long ago, for he contributed a large body of material for the verification of the theory. His embryological discoveries offer conclusive evidence of its truth. This his pupils saw, but their master, blinded by his Cuvierian education and belief in distinct specific creations, could never reach the truth, though dissatisfied with the hypothesis of creation as recorded in Genesis. He published a theory of distinct creations in many separate geographical centers, and was, therefore, quite heretical. The doctrine of evolution covers all this ground more satisfactorily, and his theory is disregarded. Why was this master in research incapable of impressing his views upon his pupils, with whom he was personally so popular? Because young and unprejudiced they sought truth for its own sake, and loved it better than even they did their admired teacher. His opposition to Darwinism, they now openly assert, served to make them more careful in their scrutiny into its weak points as described or imagined by him, and he was thus of real service in training his pupils for the adoption of the doctrine of evolution. "Of all the younger brood of naturalists whom Agassiz educated, every one—Morse, Shaler, Verrill, Niles, Hyatt, Scudder, Putnam, even his own son—has accepted evolution." (*Popular Science Monthly*, Feb., 1880.)

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[1] "Is the *Development Hypothesis* Sufficient," by Dr. James McCosh, President of Princeton College. Published in the *Popular Science Monthly*, Vol. x, p. 96.

In direct opposition to palæontological experience, that many species of organic beings have continued unchanged through successive periods of the earth's history, while others have existed during only a small portion of such a period, Agassiz maintained that one and the same species never occurs in two different periods, but that each individual period is characterized by species peculiar thereto and belonging to it exclusively. In this he shares Cuvier's opinion that all the inhabitants of successive geological formations were annihilated by the revolutions which divide two periods of the earth's palæontological history, and that a new and specifically different assemblage of organisms was created and suddenly placed upon the earth in large numbers by the Creator. "Pines," says Agassiz, "have originated in forests, heath in heather, grasses in prairies, bees in hives, herring in shoals, buffaloes in herds and men in nations."[1]

The present terrestrial fauna of Australia is acknowledged to be unique, and is it not essentially a remnant of the fauna of the Jurassic or even of an earlier age? "There is a wonderful relationship," says Darwin, "in the same continent between the dead and the living." On the hypothesis of evolution there is no difficulty in admitting that the differences between the Miocene forms of Mammalia and those which exist at present, are the results of gradual modification. "The hypothesis of evolution explains the facts of Miocene, Pliocene and recent distributions," says Huxley, "and no other supposition even pretends to account for them."

The division of the Tertiary into Eocene, Miocene, Pliocene and Post-pliocene according to the preponderance in number of extinct or recent shells, evidently admits that many species have persisted through the changes that have destroyed others.

The late T. A. Conrad, a pronounced opponent of evolution, asserts in his "Descriptions of new Genera and Species of Fossil Shells of North Carolina,"[2] that "it is a generally received opinion that some species of Miocene shells escaped the destruction of the general fauna," and that "the small amount of variation, and in *some species none at all*, seems to indicate that some few kinds of shells are now living which originated in the Miocene period." "Among these shells, the *Oliva litterata* (Lam.) lives in myriads in Tampa bay, whilst there is a Miocene *Oliva* equally abundant in the bank of Cape Fear river, which offers no characters by which to distinguish it from that fossil species." The same remark is made respecting the fossil *Marginella limatula* (Conrad), a species living on the coast of South Carolina, while he suspects identity of the fossil and the living may be shown to exist among many other species.

In his paper on "The Relations of the Horizons of Extinct Vertebrata of Europe and North America," Prof. E. D. Cope has shown that "the characteristic of the Pliocene fauna in Europe is the fact that the species belong mostly to existing genera." "In the Equus beds of Oregon, a few extinct genera in like manner share the field with various recent ones, while not a few of the bones are not distinguishable from those of recent species." Thus the bones of the fossil beaver and wolf cannot be distinguished from those of the recent, while they are also associated with the remains of an extinct fossil elephant, horse and llama. The species derived from the cave formations of the Eastern States, which Cope names the Megalonyx beds, also present many instances of extinct species mixed with the remains of those represented by the living ground-hog, porcupine, hare and rabbit and from which they cannot be distinguished.

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[1] Essay on Classification. Contributions to Natural History of the United States. By L. Agassiz. Vol. I. p. 39.

[2] "Report of the Geological Survey of N. Carolina," by W. C. Kerr. 1875. Appendix A, p. 24.

In further illustration of this error of Agassiz, we may also cite the continued existence of the *Lingulæ*, formerly included among mollusks, but now shown to be allied more closely to worms. The *Lingulæ* were numerous and important in earlier geological ages and have been continued almost from the dawn of life and as they exist in the primordial "are scarcely to be distinguished as even Prof. Dawson acknowledges[1] from those of the members of the genus which still live." The original *Lingulæ* were remarkable for the presence of phosphate of lime in their shells, a peculiarity not found in the shells of mollusks generally, which are hardened by the presence of carbonate of lime. The modern *Lingulæ* present the same peculiarity and exhibits the wonderful persistence with which they adhere to the original type.

It was the merit of Agassiz that he drew especial attention to the remarkable parallelism between the embryonal and the palæontological or the development through time and the development of organic species, genera and tribes, which is claimed as one of the strongest pillars of the theory of descent or of evolution. No one before had so distinctly stated as Agassiz did, that of vertebrate animals, fishes alone existed at first, that amphibians came next, and that birds and mammals appeared only at a much later period, and moreover that among mammals, as among fishes, imperfect and lower orders had appeared first, and more perfect higher orders at a later period. He thus showed that the palæontological development of the vertebrates was not only parallel with the embryonic, but also with the systematic development or the graduated series which we see everywhere is ascending from the lower to the higher classes, orders, &c. *Haeckel.* This doctrine is explained quite simply and naturally by the doctrine of descent, or a historical succession, and without it, is perfectly inexplicable. "So far as Agassiz's work, entitled 'An Essay on Classification,' pretends to be a scientific history of creation, it is undoubtedly a complete failure."[1]

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[1] "The Story of the Earth and Man," by J. W. Dawson. 1873. p. 41.

We are indebted to a paper entitled "Agassiz and Darwinism," by John Fiske, in the *Popular Science Monthly*, Vol. III, for most of the following remarks upon the cause of Agassiz's inability to perceive the truths of evolution.

The frequency with which the name of Agassiz has been brought before the American people through his contributions to geology, palæontology and systematic zoölogy, has rendered his name very popular, and given rise to the opinion that he was the greatest of naturalists. He by right occupied a very high position, but no exceptional supremacy can be rightly claimed for him. Both for learning and for sagacity, the names of Asa Gray, Prof. Wyman, Huxley, J. D. Hooker, Sir Charles Lyell, Ernst Haeckel and Gegenbauer, are quite as illustrious as the name of Agassiz, and these are the names of men who openly endorse and defend the Darwinian theory. Many imagine that because Agassiz studied extinct and living organisms through a life-time of research, that his opinions with reference to the relations of present life upon the globe to past life, ought to be conclusive. The distinguished Darwinian naturalists above named, are equally well qualified to form an opinion, and have arrived at conclusions diametrically opposite to those taught by Agassiz. Why this result? Not because Agassiz did not possess the power of philosophizing, but because he philosophized on unsound principles. He erred because his philosophy was not the natural outgrowth from the facts of nature, which lay at his disposal, but is made up out of sundry traditions of his youth, and because he long ago brought his mind to acquiesce in various generalizations of a thoroughly unscientific or non-scientific character, the further maintenance of which appeared to him to be incompatible with the Darwinian theory. He also evidently arrived too early at that rigidity of mind which prevents us from properly comprehending new theories, and which we should all of us dread as a real evil. It has been broadly asserted by a learned writer familiar with the Darwinian controversy, that he has never met with any indication that Agassiz knew what the Darwinian theory really is! "Against a development as it was taught forty years ago he was fond of uttering his expressions of dislike, but with the modern development theory he never betrays the slightest acquaintance, but contents himself with making profoundly dark metaphysical phrases do the work which properly belongs to observation and induction."

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[1] "The History of Creation," by Ernst Haeckel. Vol. I., p. 70.

[*To be continued.*]

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HALL'S SECOND ARCTIC EXPEDITION.[1]

OF the many men who have won fame in Arctic exploration, none have manifested greater heroism and perseverance than Charles Francis Hall. His ardent faith, which persuaded him to believe in the existence of some member of the lost expedition of Sir John Franklin at as late a period as twenty years after the abandonment of the *Erebus* and *Terror*, sustained him amidst the perils and hardships and disappointments of nearly eight years of life amongst the Esquimaux. Alone, with very slender means, he was yet able to obtain much important information regarding the fate of the officers and crews of that most unfortunate expedition, and to add materially to our geographical knowledge of the regions bordering upon the Cumberland gulf and the Bay of Hudson.

The story of his last voyage in the *Polaris*, and his death at almost the furthest Northern point yet reached by explorers is well known. Of his first journey, in 1860–62, to the Cumberland gulf and Frobisher's bay, he has given us a full account in his "Arctic Researches." But until now no account has been given to the public of his longest and most successful journey. This occupied a period of five years and six months, and upon his return home he began immediately his preparations for his North Polar expedition, and was unable to prepare an account of his travels. Fortunately his journals and notes, mostly carefully made and preserved, were in the possession of his family, and were purchased from them by the Navy Department under an

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[1] Narrative of the Second Arctic Expedition made by Charles F. Hall. His voyage to Repulse bay, Sledge Journeys to the Straits of Fury and Hecla and to King William's Land, and Residence among the Eskimos during the years 1864–'69. Edited under the orders of the Hon. Secretary of the Navy by Prof. J. E. Nourse, U. S. N. U. S. Naval Observatory.